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Abstract

This project presents a mobile application designed to capture and organize location-based data with images and notes for time series analysis. Built using SQLite for local storage and Firebase for global multi-user access, the system enables collaborative, real-time data collection and visualization. It integrates YOLOv11 for object and pose detection and ArcFace for name recognition, allowing intelligent context awareness and automated event logging. The application supports spatial-temporal analysis for uses such as urban planning, behavioral monitoring, and smart environment management.

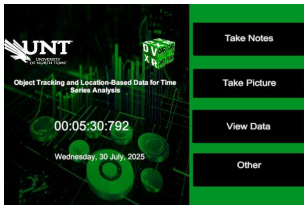


Figure 1. Home page of the app, showing main modules



Figure 2. Display all data in scroll list view

Methodology

- Developed in Unity (C#) with a real-time, user-friendly interface.
- Integrated Firebase for multi-user access and cloud sync.
- Used YOLOv11 for object and pose detection, ArcFace for name recognition.
- Logged user ID, pose, objects, and GPS data in SQLite and Firebase.
- Visualized collected data for time series analysis and anomaly tracking.

1. Detection & Logging Module



Figure 3. Detection and local display of Data



Figure 4. Object Detection use case

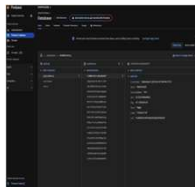


Figure 5. Global Dataset Firebase

Technical Tools

- Unity (C#): Main development environment for mobile and real-time visualization.
- OpenCVForUnity & ONNX Runtime: For running YOLOv11 and ArcFace models efficiently on-device.
- Firebase: Handles authentication, multi-user synchronization, and cloud data storage.
- SQLite: Local database for offline storage and time series logging.
- Python & Jupyter: Used for training and evaluating detection models.
- Android Build Tools: For deploying and testing the app on mobile devices.

Conclusions

The developed system demonstrates how real-time multi-user detection can enhance public safety through intelligent surveillance and data-driven insights. By integrating YOLOv11-based object and pose detection, ArcFace name recognition, and Firebase synchronization, the app effectively identifies anomalies, logs spatial-temporal data, and visualizes behavioral patterns through time series analysis.



Surveillance and Security Solution Providers



Smart City and Urban Planning Agencies



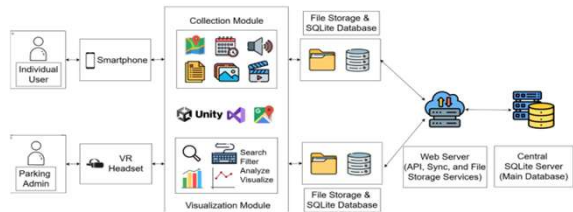
Researchers in Computer Vision and AI

Figure 9: Applications

Introduction

This project focuses on developing an intelligent mobile system capable of detecting and responding to anomalies in real time, specifically in parking lot environments. Using object detection, pose estimation, and name recognition, the system identifies critical threats such as firearms, recognizes suspicious body postures, and matches individuals with a stored database. When a potential threat is detected, it automatically sends an alert containing the detected object, pose, and identity if available. In addition to real-time prevention, the application records all spatial and temporal data for time series analysis, enabling post-event evaluation and behavioral insights to enhance public safety and situational awareness.

Architecture



Objectives

To develop a real-time, multi-user mobile system that detects objects, poses, and identities for anomaly recognition in parking lot environments. The goal is to enable instant alerts and generate time series insights to support preventive safety analysis and smarter surveillance.

2. Multi-User Synchronization Module

- Uses Firebase Authentication and fire Store for global, multiuser data access
- Enables collaboration, allowing users to contribute and view Shared records

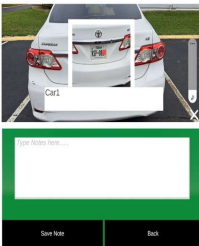


Figure 6. Data Logging

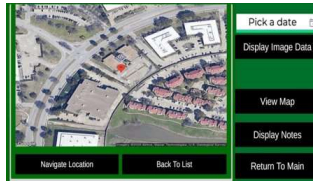


Figure 7. Display of locations using pins

3. Analytics & Visualization Module

Generates graphs, charts, and summaries to analyze trends such as the busiest days, detection frequency, and anomaly patterns. Supports time series and behavioral insights for smarter surveillance.



Figure 8: Location of multiple users on maps

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